

Microbead-Based Biomimetic Microenvironments Enhance Survival and Function of Insulin-Producing Cells

Wei Li

NSERC Postdoctoral Fellow
Department of Chemical Engineering
Massachusetts Institute of Technology

Diabetes is caused by the loss or dysfunction of insulin-secreting β -cells in the pancreas. β -cells reduce their mass and lose glucose sensitivity in vitro, likely due to insufficient cell-cell and cell-extracellular matrix (ECM) interactions as β -cells lose their native microenvironment. Herein, I present a novel strategy to build ex-vivo 3D environment for studying the survival and function of the cultured β -cells. Polymer microbeads with similar size as the β -cells were modified with cell surface transcriptional factors, as well as components from pancreatic-tissue-specific ECMs. Primary β -cells were cultured in direct contact with these 'synthetic neighbors' to form 3D close-packed structures, which created a biomimetic microenvironment that was able to promote native cell-cell and cell-ECM interactions. The result is the sustained maintenance of β -cell function in vitro and prolonged cell survival over three weeks. This microbead-based approach can be explored to be a general 3D culture platform for other cell types.